CONSOLIDATION COAL COMPANY MINE No. 11,
LEPLEY VENTILATOR
East side of State Route 936
Midlothian Vicinity
Allegany County
Maryland

HAER No. MD-87-A

PHOTOGRAPHS

WRITTEN HISTORICAL AND DESCRIPTIVE DATA

HISTORIC AMERICAN ENGINEERING RECORD
National Park Service
Northeast Region
U.S. Custom House
200 Chestnut Street
Philadelphia, PA 19106

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HISTORIC AMERICAN ENGINEERING RECORD

CONSOLIDATION COAL COMPANY MINE No. 11, Lepley Ventilator

HAER No. MD-87-A

Location: East side of State Route 936, approximately 0.1 mile south of Interstate 68 Midlothian vicinity, Allegany County, Maryland
UTM: 17.676290.4388805
Quad: Frostburg, Md.-Pa., 1:24,000

Dates of Construction: 1909

Present Owner: Allegany Coal and Land Company
P.O. Box 410
Depot Road
Frostburg, Maryland 21532

Present Use: Vacant (ruin)

Significance: The Lepley ventilator is significant as one of the few centrifugal mine ventilation fans in the eastern United States, surviving in situ. The ventilator, patented in 1903 by Daniel Lepley, helped improve the health and safety of miners by removing impure air and gases and providing fresh air to mine passages.

Project Information: The U.S. Soil Conservation Service (SCS) has been contracted by the Allegany Coal and Land Company to reclaim the site of the Consolidation Coal Company Mine No. 11. This reclamation project will include removal of existing structures on the site and revegetation of disturbed areas. Reclamation is scheduled to begin in late 1993.

Preparers of Documentation: Richard Meyer/Principal Architectural Historian
Douglas C. McVarish/Project Architectural Historian

John Milner Associates, Inc.
309 North Matlack Street
West Chester, Pennsylvania 19382

October 1993

CONTEXT

The Lepley ventilator is the most prominent standing feature of the Consolidation Coal Company Mine No. 11. It is situated near the center of a cluster of intact site features, approximately 350 feet east of State Route 936. The ventilator, a large, narrow, cylinder with its axis oriented roughly east-west, is contained within the foundation walls of the fan house. This structure, no longer extant, was illustrated in photographs that accompanied the 1981 Maryland historic sites survey of the mine complex. A shaft extends from the west side of the ventilator to the cast-iron I-beam mount for a steam engine. At the south end of the beam is a cylindrical steam engine cylinder. North of the ventilator is the north foundation wall of the fan house. This wall rests atop the coursed ashlar south wall of the air/manway shaft. The rectangular air/manway shaft measures approximately 15 feet east to west and 17 feet north to south. The aerovane fan adjoins the north end of the east wall of the air/manway shaft.

East of the ventilator and fan house foundation are several site features. These include two large circular brick shafts, which may have been steam shafts for the boiler house that historically occupied that area; a steel pipe scaffold, the purpose of which is unknown; and a smaller cylindrical brick shaft. West of the ventilator is a slight depression containing a marshy stream bed. West of the stream bed is the aerovane fan hood, northwest of the ventilator, two manway shaft doors, west of the ventilator and an unidentified fragment of crumpled sheet metal, south of the shaft doors, and southwest of the ventilator. South of the ventilator is a wooded gully. The concrete foundation walls for a water tank are located in this gully.

MINE VENTILATION

Ventilation of mines was necessary for several reasons. A sufficient supply of fresh air had to be provided to permit miners and mine animals to breathe. Explosive and inflammable gases, which, if allowed to accumulate, could accidently ignite and cause injuries to miners and damage to the mine. These gases had to be driven out or diluted. Other gases that are formed by the discharge of explosives, as well as gases given off by the decay of mine timbers and the oxidation of ores, also had to be dissipated.[1]

Mines were ventilated in one of five ways: 1) natural ventilation; 2) furnaces; 3) waterfalls; 4) steam jets; and 5) mechanical ventilators.[2] In all of these methods of ventilation two openings into the mine were required.[3] Of these methods, only natural ventilation, furnaces, and mechanical ventilators were used in Maryland coal mines.[4]

Initially, Maryland coal mines were ventilated naturally by an air shaft which was sunk into the mine workings a sufficient distance from the mine entrance to result in the flow of air through the mine. This shaft was covered with a wooden stack.[5] Depending on the air flow, the shaft functioned as an exhaust or intake port. Natural ventilation depends for its action on the difference in weight between two columns of air of different densities, the flow being from the heavier to the lighter column. This difference in density is primarily due to a difference in temperature

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[1]W.M. Weigel, *Ventilating Equipment.* Library of Coal Mining and Engineering series (New York: McGraw-Hill Book Company, Inc., 1915), 1.

[2]Ibid.

[3]Ibid., 5.

[4]Donna M. Ware, *Green Glades & Sooty Gob Piles: The Maryland Coal Region's Industrial and Architectural Past* (Crownsville, Maryland: Maryland Historical and Cultural Publications, 1991), 221.

[5]Ibid.

between the two columns.[6] With a constant temperature inside the mine, the direction of the air current varied depending on the temperature outside. In winter, the heavier outside air caused an inward flow of air, while in the summer, the heavier inside air caused an outward flow of air.[7]

Underground furnaces and surface furnace stacks were also used to ventilate early Maryland coal mines. James B. Thomas, a mine superintendent for the Consolidation Coal Company, first introduced this ventilation method to the region, probably in the 1840s or 1850s. In this method, brick furnaces with semicircular arches were constructed at the bottom of mine air shafts.[8] Their operation was based on the same principle as natural ventilation, the difference in temperatures, and, therefore, densities of two air columns.[9] The furnaces drew bad air through the workings and expelled it through a brick or wooden stack, built at the surface.

During the mid-nineteenth century mechanical mine fans were developed in England. This technology was first used in Maryland in 1885. A major impetus for the installation of fans in Maryland mines may have the passage of state laws, beginning in 1876, requiring "a proper system of pure air ventilation to be well circulated...throughout the entire mine."[10] Although the provisions of mine inspection laws were fought by mine owners, and state inspections were lax, most mining companies soon installed fans to improve ventilation.

With mechanical ventilation, an air current was generated by means of a rotating or reciprocating mechanical fan. This fan was driven by a motor operated by steam, air, gas, electricity or water power. Fans were employed to force air through the intake shaft and out through the upcast shaft or to exhaust the air at the outlet, causing a partial vacuum and setting up an air current from the downcast to the upcast shaft.[11] When fans exhausted air from the mine, the working shaft or drift served as the downcast or intake; when fans blew air into the mine, the working shaft or drift served as the upcast or outlet. This arrangement was necessary so that the shaft occupied by the fan could be sufficiently air-tight to create the proper ventilation.[12]

Ventilators ranged in size from the small centrifugal fans used to ventilate the face of a single drift or tunnel and requiring only three to four horsepower for operation to the large colliery fans, ventilating all the workings of a large coal mine and consuming 300 horsepower or more.[13]

The first mine fan in the Georges Creek Basin of Maryland was installed at the Consolidation Coal Company's Eckhart Mine. This fan, no longer extant, was described in a 1887 mine inspection report as a modified form of the Guibal fan. The Guibal fan was one of the first mechanical mine fan designs and was characterized by its large

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[6]Weigel, *Ventilating Equipment*, 1.

[7]Ibid., 1-2.

[8]Ware, *Green Glades & Sooty Gob Piles*, 221.

[9]Weigel, *Ventilating Equipment*, 2.

[10]Katherine A. Harvey, *The Best-Dressed Miners: Life and Labor in the Maryland Coal Region, 1835-1910* (Ithaca, New York: Cornell University Press, 1969), 210.

[11]Weigel, *Ventilating Equipment*, 4.

[12]Ibid., 5.

[13]Ibid., 4.

diameter and its comparatively few blades.[14] The fan installed in the Eckhart Mine measured 16 feet in diameter and had four foot blades that curved backwards with their convex sides facing the direction of the wheel's motion. This fan worked well. As noted in the report, "It has more than met expectations in accomplishing greater work than designed. It supplies abundance of air to three mines--Eckhart, New Hope, and Allegany."[15]

By the 1890s fans were the accepted means of mine ventilation, and most large mines in the Georges Creek Basin had at least one. Most of the early fans were of the centrifugal type. This type of fan had a horizontal shaft fitted with hubs rigidly attached to it. From these hubs radiated arms or spokes to which blades or vanes were attached. The wheel was usually enclosed in a spiral casing which had an opening in one or both sides at the center and another opening in the circumference. As the fan revolved, air was drawn in through the center opening. It then passed between the blades into the spiral casing and out through an opening in the circumference. If the fan drew air through its central opening from the mine, it was referred to as an exhauster. If it delivered air to the mine through the opening in its circumference, it was referred to as a blower.[16] Most of the centrifugal fans used in the Georges Creek Basin were blowers.[17]

Consolidation Coal Company Mine No. 11 is significant because it contains one of only a few centrifugal mine fans in situ in the eastern United States and the only known one located in Maryland. It is also significant for the survival of the aerovane ventilation fan. The side-by-side presence of two types of mine ventilation equipment demonstrates the evolution of mine ventilation technology.

LEPLEY VENTILATOR

The Lepley ventilator was invented by Daniel F. Lepley, a mining engineer from Connellsville, Fayette County, Pennsylvania. Lepley obtained patents on many devices used in coal mines. These included a triplex pump, a duplex pump, a blast fan, a safety break for an elevator, a coke oven attachment, a friction clutch, a steam engine, a mine cage,[18] and a ventilator for mines. Lepley was granted Patent No. 720,264 for his ventilator. The patent was dated February 10, 1903.

In his patent application, Lepley noted that the ventilator was "an improved ventilator for mines adapted for use either in forcing a current of air downwardly in a mining-shaft or for acting exhaustively for drawing air upwardly out of a mine-shaft to remove impure air or gases therefrom."[19]

The Lepley ventilator (see following figures) consisted of a fan rotated by a sbaft (2), situated inside a rectangular hood. The fan was constructed of spokes (9), radiating from the shaft. The spokes supported bars (10) which were crossed in an eight-pointed star pattern. The outer ends of these bars were curved to form arms (11). Attached to

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[14]Ibid., 17-18.

[15]As cited in Ware, *Green Glades & Sooty Gob Piles*, 221.

[16]Weigel, *Ventilating Equipment*, 9.

[17]Donna M. Ware and Mark R. Edwards, *Final Report of the Coal Region Historic Sites Survey* (Annapolis, Maryland: Maryland Historic Trust, 1984), 498.

[18]See *Annual Report of the Commissioner of Patents*, 1900-1907 editions.

[19]D[aniel] F. Lepley, *Ventilator for Mines*, Patent No. 720,964, February 10, 1903, Microfilmed patent record in Government Documents Department, Free Library of Philadelphia, 3.

the arms were blades (12), oriented parallel with the shaft. The outer portion of each blade was curved in cross-section (13) to correspond with the curvature of the arms. Doors (5), situated at one end of the hood, could be opened or closed at will. A cylindrical drum (6) surrounded the fan and was oriented in a vertical position. Located on the inner side of the drum was the lower end of a vertical flue (7). The sides of the drum were penetrated with intake openings (8). The fan was located off-center in the drum (6), operating almost in contact with one side of the drum (15).

The ventilator was rotated by a power belt and pulley (16). An opening located in the side (15) of the drum connected with the lower end of the flue (7). This opening could be closed by the hinged wing (17) of the valve (18). This valve formed the bottom of the flue (7). Operation of this valve mechanism was controlled by a winch (19) and elevating cords (20). The open position of the valve is indicated with dotted lines in Figure 1. In the bottom of the hood to the rear of the flue (7) was a valve (23). In its horizontal position, the valve would preclude airflow between the flue (22) and the hood (7). In its lowered position, it would allow airflow between the flue (22) and the hood (7). Lepley proposed operation of this mechanism with a winch and cords.

When the ventilator was used as a blower, the doors (5) were opened at the outer end of the hood, and the valves (17, 18, and 23) were closed as shown in Figure 1. The rotation of the fan would draw air inwardly through the doors (5) and intakes (8) and force it through the flue (22) into the mine shaft. When used to exhaust air or gases from the shaft, the doors (5) were closed, and the valves (17, 18, and 23) were lowered to close the flue and open an air passage between the flue and the hood. The revolving fan would draw the air current upward from the mine shaft through a portion of the flue (22) to the valve (23), upward into the hood (7), outwardly in the hood to the openings (8), and through the openings into the drum (6). The revolving motion of the fan would force the blast upward through the flue (7).[20]

The Lepley ventilator at Consolidation Coal Company Mine No. 11 was installed in 1909 when the former pumping shaft was converted to large-scale coal production. Improvements made at that time included the ventilator installation, the retimbering of the mine shaft, the construction of a new head-house [no longer extant], and the installation of a new double hoisting engine and a safety elevator [both no longer extant].[21] The ventilator was initially powered by steam from a boiler house at the mine site.[22] In the early 1920s, the boiler house was dismantled, and the ventilator was converted to electric power. A laminated wood pulley was added to the fan at that time. The pulley connected the fan to an electric motor via a belt. This pulley, extant in 1981[23], is no longer present.

Air produced by the fan was blown out of the discharge chimney in a horizontal direction into the air shaft, located immediately north of the fan. The side chambers, flanking the discharge chimney, functioned as fan inlets. The discharge chimney could be opened from above, as evidenced by the extant crank and gear mechanism formerly

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[20]Ibid., 1-2.

[21]John H. Donahue, *Annual Report of the Mine Inspector for Allegany and Garrett Counties, Maryland*, May 1, 1909-May 1,1910 (Cumberland, Maryland: Evening Times Printers, 1910), 26.

[22]John L. Casey, *Annual Report of the Mine Inspectors of the State of Maryland*, Period from May 1, 1917 to May 1, 1918 (Baltimore: King Brothers, 1918), 58.

[23]Donna M. Ware, *Pumping Shaft, New Shaft, and Consolidation Coal Co. Mine No. 11*, Inventory Form for Maryland State Historic Sites Survey (Filed at Maryland Historical Trust, Crownsville, Maryland), 3.

located on the roof of the now-demolished fan bouse.[24] This mechanism suggests that, like tbe fan described in Lepley's patent application, the New Shaft centrifugal fan was reversible, capable of blowing air into the mine or exhausting it from the mine.

The ventilator produced 129,000 cubic feet of air at 68 revolutions per minute. It served four Consolidation Coal Corporation mines: No. 3, a drift mine of the Big Vein Seam, located near Eckhart, Maryland; No. 10, a drift mine of the Tyson Seam, located near Eckhart; No. 11, a shaft mine of the Tyson Seam, located near Frostburg, Maryland; and No. 12, a sbaft mine of the Big Seam, located at Shaft, Maryland.[25] The ventilator was replaced in 1940 by the aerovane fan, situated to the north of the ventilator.

PRESENT CONFIGURATION OF LEPLEY VENTILATOR

The ventilator was originally located within a four-chamber brick fan house witb a concrete foundation.[26] This fan house, shown as it appeared in 1981 in Ware's *Green Glades & Sooty Gob Piles*,[27] consisted of a tall, narrow center section, oriented north-south with lower shed roofed chambers adjoining its east and west walls. Adjoining the southern portion of the wall of the west chamber was a shed roofed chamber with a segmentally arched opening in its north wall. The center chamber contained the ventilator and functioned as a discharge chimney. The two flanking chambers functioned as ventilator inlets. The westernmost chamber was the engine room and contained the extant engine mount and engine cylinder.[28]

Remnants of this fan house include the concrete foundation walls and large numbers of hricks. The east foundation wall measures 27 feet in length and rises 4 feet above the ground at its north end and 2 feet above the ground at its south end. At its south end, a wall extends 6 feet to the west, approximately 5 1/2 inches south of the fan. Anotber wall extends 5 feet 2 inches from the west end of this south wall.

The ventilator rests partially within a cradle formed by the concrete foundation walls of tbe now-demolisbed fan house. The east foundation wall extends 27 feet from nortb to south. At the south end of this wall, a 6 foot long wall extends to the west. A third wall extends 5 feet 2 incbes southward from the west end of the second wall. A fourth wall extends approximately 9 feet 3 inches from the west end of the third wall. Perpendicular to the west end of the fourth wall is a fifth wall, measuring 32 feet 2 inches in length, that intersects the south wall of the air/manway shaft.

The ventilator itself is an open cylinder, measuring 20 feet 4 inches in diameter and 5 feet 9 inches in width. The circular, doughnut-shaped front and rear panels of the ventilator are constructed of 3/8 incb thick steel plate. Four perpendicular steel spokes, eacb measuring 6 1/4 inches in width, connect eacb of the panels to the bub of the fan. The blades of the ventilator are attached to these steel panels at either end. The entire ventilator structure is

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[24]Ibid.

[25]Keystone Consolidated Publisbing Company, Inc., *The Coal Field Directory and Mining Catalogue, Pocket Edition of Directory Section* (Pittsburgb: Keystone Consolidated Publishing Company, Inc., 1914), 201-202.

[26]Donna M. Ware, *Green Glades & Sooty Gob Piles* (Crownsville, Maryland: Maryland Historical & Cultural Publications, 1991), Figures 234, 235.

[27]Ibid., Figure 229.

[28]Ware, *Pumping Shaft*, 3.

reinforced by four pairs of tie bars, arranged in "x" patterns connecting the front and rear panels. These tie bars are oriented perpendicular to each other.

The shaft of the ventilator is 10 inches in diameter and rests on cradles bolted to box beams. The east box beam, in tum, rests on end concrete supports. The shaft extends 12 feet 7 inches west from the hub of the ventilator. At the west end of the shaft is a crank mechanism. This mechanism originally was connected to the ventilator power source. The shaft extends 37 inches east of the fan hub. This portion of the shaft also rests on an 18 inch wide cradle. This cradle rests on the center of a box beam. This beam measures 20 inches in width and 14 feet in length.

The ventilator was originally powered by a 80 horsepower,[29] 65 rpm horizontal steam engine,[30] manufactured by Crawford and McCrimmon of Brazil, Indiana. This engine had 16 inch by 30 inch cylinders and a 30 inch stroke. Projecting from the engine was a 4 inch steam pipe and a 6 inch exhaust pipe.[31] The cast-iron mount for the steam engine, as well as the cylinder and shaft, is still in place to the west of the ventilator. The mount, cylinder, and shaft rest on a battered concrete foundation, measuring 16 feet 10 inches in length, 6 feet in height, and 4 feet 5 inches in width at its top. The engine and shaft mount is a cast-iron I-beam, measuring 16 feet in length and 23 and 1/2 inches in width. At the south end of the beam is the cylinder, measuring 21 and 1/2 inches in diameter. Adjoining the east side of the cylinder is a circular metal plaque with protruding threaded bolts. Atop the cylinder is a rectangular metal box with additional metal bolts.

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[29]Ibid., 3.

[30]Ware and Edwards, *Final Report of the Coal Region Historic Sites Survey*, 500.

[31]Allegany Coal and Land Company records concerning Consolidation Coal Company Mine No. 11, Frostburg, Maryland.

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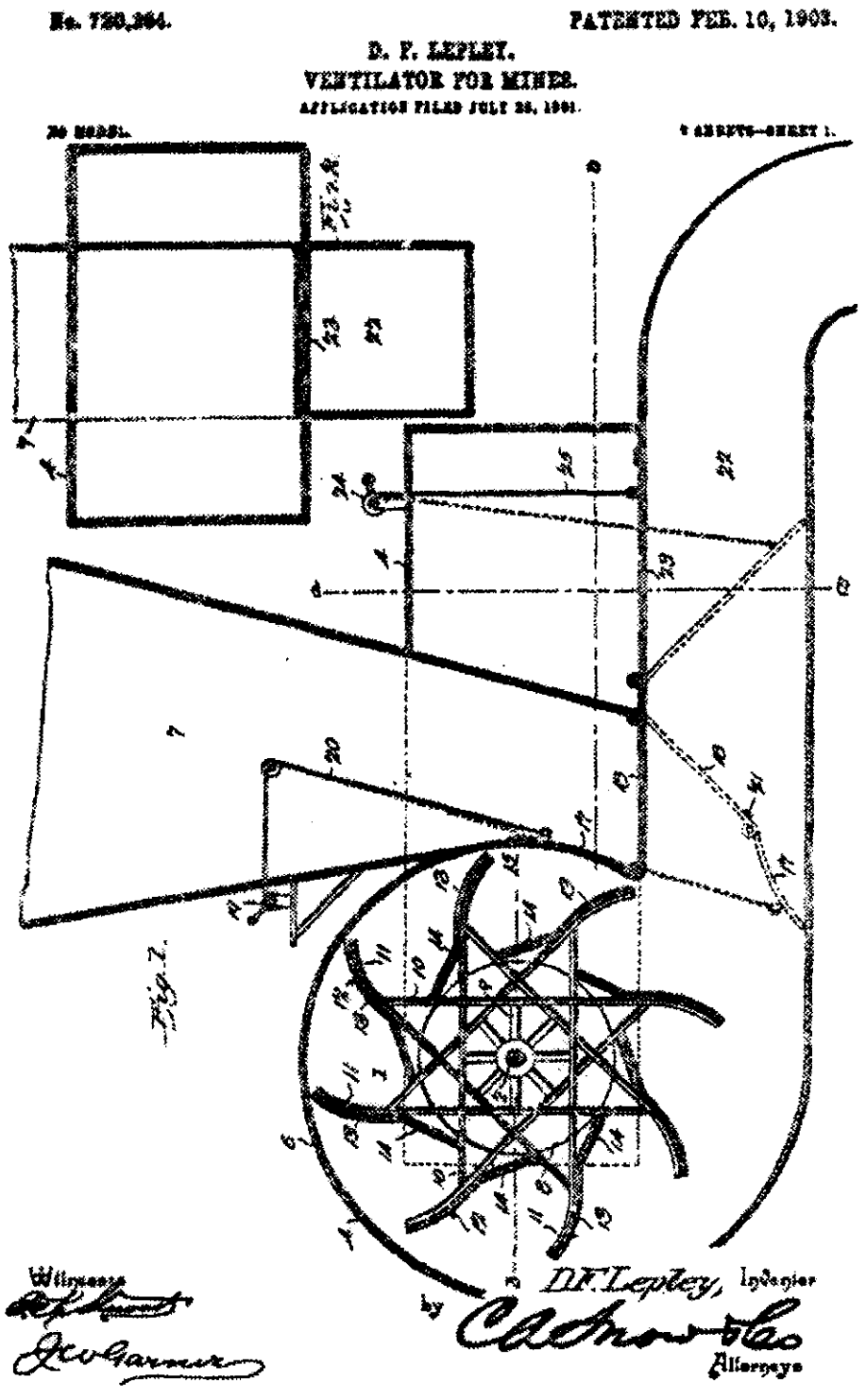


Lepley, *Ventilator for Mines*. Figure 1 of
Patent No. 730,264 (February 10, 1903)

No. 730,264. PATENTED FEB. 10, 1903.

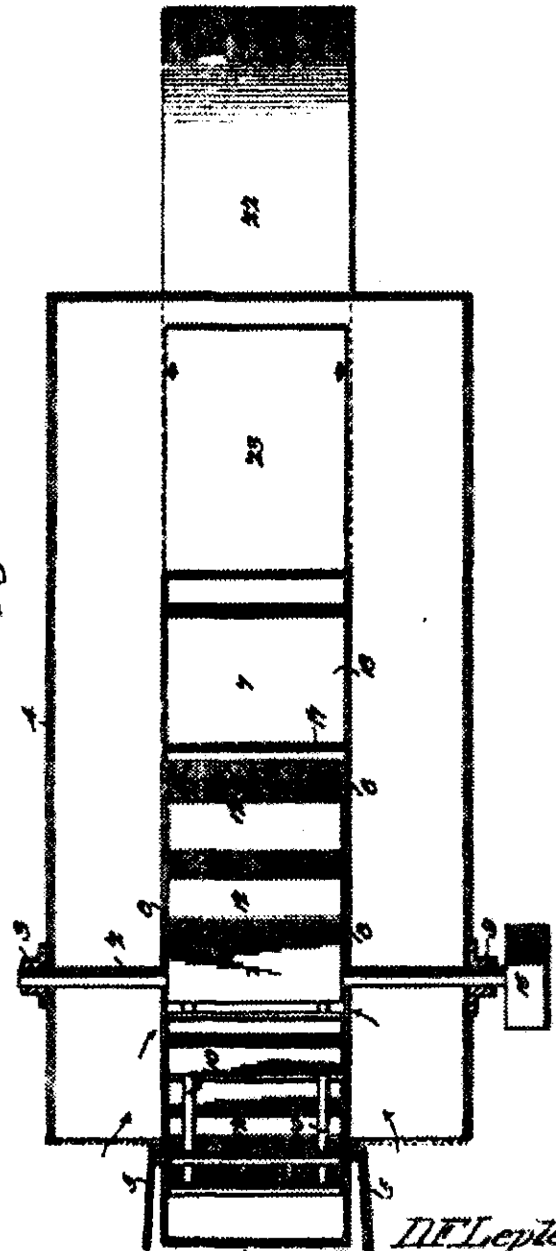
D. F. LEPLEY.

VENTILATOR FOR MINES.

APPLICATION FILED JULY [illegible], 190[illegible].

NO MODEL. 2 SHEETS—SHEET 2.

Fig. 2.



Witnesses

D. F. Lepley, Inventor

by C. A. Snow & Co. Attorneys

Lepley, *Ventilator for Mines.* Figure 2 of Patent No. 730,264 (February 10, 1903)